

NARROW WEB CORONA TREATER

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CROSS REFERENCE TO RELATED APPLICATIONS

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FIELD OF THE INVENTION

This invention relates broadly to a corona discharge device and, more particularly, pertains to a unitized corona treater and power supply especially useful in narrow web applications.

BACKGROUND OF THE INVENTION

Corona discharge devices are used to treat the surface of various materials such as polyethylene web, by passing the web between a pair of electrodes. Generally, one of the electrodes comprises a grounded treater roll which is used to carry the web through a discharge zone, and an electrode assembly mounted for movement between an operative position spaced from the treater roll and an inoperative position for maintenance or repair. The electrode assembly includes a plurality of electrodes connected to a high voltage source and mounted on a common base with a hollow, ceramic or insulating member associated with each of the electrodes. The electrodes are offset from one another to provide a corona discharge across the entire surface of the web. The corona discharge treatment results in changing the molecular structure of the web so as to increase the wettability of the web which, in turn, makes the surface more amenable to receiving and retaining an applied coating such as, for example, printing ink for printing indicia on the web of a label press or the like.

The corona discharge device or treater has an electrode magazine that is normally removed for periodic cleaning and maintenance of the electrodes. In past designs, the connection between the high voltage source and the electrodes would normally be a high voltage wire joined permanently to the electrodes making it very difficult and extremely dangerous to remove the electrode magazine from the treater.

30 The corona treater also has mounting plate structure which connects  
the corona treating equipment to the frame of the label press. A front mounting  
plate normally supports the treater roll as well as a pair of web guide rolls and an  
electrode support tube, and provides the necessary alignment to reduce wrinkles  
and twisting of the web. In the past narrow web designs, the rolls were  
35 cantilevered from a single mounting plate or supported to permanently mounted  
plates at each end of the treater. The cantilevered design would not provide the  
mechanical strength for the longer treat width system and the two-plate design  
made installation difficult and more specifically designed for a particular press  
manufacturer.

40 The corona treating system further includes a mechanism to thread  
the web through the treater system and in addition, a method of cleaning the  
electrode assembly and performing maintenance. In the past, the electrode  
magazine would normally fasten to the electrode support tube and require the  
assembly to be rotated away from the treater roll before the magazine could be  
45 moved or cleaned. This method is very costly and takes up additional machine  
space for the pivoting of the electrode assembly.

The corona treater additionally has a mechanism which is used to  
adjust the gap between the high voltage electrodes and the treater roll. In past  
systems, this adjustment was normally accomplished with an adjustment device  
50 located on each end of the electrode assembly which raises and lowers the electrode  
depending on how far the adjustment device was turned. This type of adjustment  
did not provide consistent gap adjustment on both ends of the electrode assembly  
and requires a gapping gauge to set the proper distance between the electrode and  
the treater roll.

55 Accordingly, it is desirable to rectify the shortcomings of prior art  
constructions by providing a corona treater having a fast and simple, high voltage  
connection between the electrodes and high voltage source and which can be easily  
disconnected from the corona treater making removal of the electrode magazine  
safer and quicker. It is also desirable to provide a corona treater having a mounting

60 plate design with the ability to adjust the frame to the type of press it was being  
mounted to allowing for a standard machine design for all presses. There is a need  
for a corona treater having a simple mechanism to support the electrode magazine  
which can easily slide out partially to allow webbing of the treater roll or can be  
completely removed for maintenance and cleaning. Likewise, there is a need for a  
65 corona treater having a single adjustment device at the front end of the treater  
system which is easily accessible to the operator. Such a single device when  
operated will adjust the electrode gap evenly across the treater roll surface and  
prevent uneven treatment levels due to improper adjustment.

#### SUMMARY OF THE INVENTION

70 It is a general object of the present invention to provide a corona  
treater which allows printers to produce high quality print on most any web or  
substrate.

It is one object of the present invention to provide a combined corona  
treater and power supply which will enable quick installation, easy operation, faster  
75 press speeds and increased productivity.

It is also an object of the present invention to provide a corona treater  
having an affordable, compact design with low maintenance.

In accordance with one aspect of the invention, a corona treater is  
provided with structure for permitting slidable mounting of the electrode magazine  
80 relative to the support tube.

In another aspect of the invention, a corona treater is provided with  
structure for enabling adjustment of the gap between the treater roll and the  
electrode magazine.

In yet another aspect of the invention, the corona treater provides for  
85 modular mounting to a variety of printing presses.

In still another aspect of the invention, the corona treater provides for  
a safe, spring-biased electrical connection between the electrodes and a high  
voltage source.

In one aspect of the invention, a corona discharge device is adapted to be used in conjunction with a printing press. The device includes a cabinet housing and on-board power supply associated with a high voltage transformer. A rear end plate depends from the cabinet, and a front end plate spaced apart in parallel relationship from the rear end plate also depends from the cabinet. An electrode support tube is fixedly mounted in the cabinet and has an electrode magazine slidably mounted on the support tube between an operative position and an inoperative position. The magazine includes a series of parallel electrodes. A grounded treater roll is rotatably mounted on a first shaft between the rear end plate and the front end plate and below the support tube. A pair of spaced idler rolls is rotatably mounted on respective second and third shafts between the rear end plate and the front end plate below the treater roll such that a flexible web is guided upwardly by the idler rolls and wound about the treater roll beneath the electrodes. The high voltage transformer includes a high voltage wire terminating in a high voltage connection for establishing a high voltage field between the electrodes and the treater roll. A high voltage connection includes a pair of non-conductive spacers projecting rearwardly from the rear end plate, a connector plate joining the spacers, a spring loaded screw connected to the high voltage wire and extending forwardly from the connector plate, and a conductive bus bar connected to the rear end of the electrodes and engagable with the screw when the magazine is in the operative position. A lower slide support is mounted between a bottom of the cabinet and a top of the support tube. The front end plate is slidably adjustable along the slide support and the first, second and third shafts to define a universal mounting device adapted to fit various frames of the printing press. A grooved slide track is secured for slidable movement to opposing sides of the support tube, and a pair of slide rails is mounted on the magazine such that the rails align with the grooved slide tracks to slidably support the magazine on the support tube. The front of the magazine includes a rotatable handle having a latch engagable with a suitable opening in the bottom of the support tube for holding the magazine in the operative position. The magazine includes detent structure engagable with the

support tube for preventing and permitting slidable removal of the magazine from  
120 the support tube. The slide tracks include slot structure enabling the slide tracks  
when moved back and forth to simultaneously move up and down so that the  
magazine will be incrementally raised or lowered to enable an adjustment of a gap  
between the treater roll and the magazine. An adjustment device is mounted on a  
front of the support tube, the adjustment device including a rotatable knob having a  
125 rod tightly screw threaded into a cover plate on the support tube whereby  
unscrewing of the knob will permit the slide tracks to move back and forth as well  
as up and down.

In another aspect of the invention, a corona discharge device is  
provided for corona discharge treatment of continuous webs. The device has a  
130 front end plate and a rear end plate spaced from the front end plate in parallel  
relationship therewith. An electrode support tube is mounted on the front end plate  
for supporting an electrode magazine having a series of electrodes associated with a  
high voltage source. The magazine is movable between an operative, web treating  
position and an inoperative, maintenance position. A treater roll is rotatably  
135 mounted between the front end plate and the rear end plate below the support tube,  
and a pair of idler rolls is rotatably mounted between the front end plate and the  
rear end plate below the treater roll such that a web to be treated is guided upwardly  
by the idler rolls and wound about the treater roll beneath the electrodes. The  
invention is improved in one respect by a cabinet having an integral power supply  
140 joined in a high voltage connection to the electrodes for establishing a high voltage  
field between the treater roll and the electrodes. The high voltage connection  
enables hands-free connection of the electrodes with the power supply when the  
electrode magazine is in the operative position, and permits disconnection of the  
electrodes from the power supply when the electrode magazine is in the inoperative  
145 position. The invention is improved in another respect by slidable structure  
enabling the electrode magazine to be slidably mounted on the support tube  
between an operative or web treating position, and an inoperative or maintenance  
position. The invention is improved still further by an adjustable slide arrangement

mounted on the support tube for enabling the front end plate to be slidably movable  
relative to the support tube so that the front end plate defines a universal mounting  
plate adapted to be connected to various frames of a printing press. The invention  
is still further improved by a slide and slot arrangement between the support tube  
and the electrode magazine providing sliding movement of the electrode magazine  
relative to the support tube, and simultaneously permitting incremental raising and  
lower of the electrode magazine relative to the support tube to enable adjustment of  
a gap between the treater roll and the magazine.

Various other objects, features and advantages of the invention will  
be made apparent from the following description taken together with the drawings.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The drawings illustrate the best mode presently contemplated of  
carrying out the invention.

In the drawings:

Fig. 1 is a perspective view of the corona treater embodying the  
invention;

Fig. 2 is a longitudinal, cross sectional view taken through the corona  
treater of Fig. 1;

Fig. 3 is a side elevational view of the corona treater in Fig. 1;

Fig. 4 is a fragmentary, cross sectional view of the front end of the  
corona treater shown in Fig. 2;

Fig. 5 is a fragmentary, cross sectional view of the rear end of the  
corona treater shown in Fig. 2;

Fig. 6 is a perspective view of a high voltage electrode connection  
with the electrode magazine in an operative condition; and

Fig. 7 is a perspective view of the high voltage electrode connection  
with the electrode magazine in an inoperative position.

## DETAILED DESCRIPTION OF THE INVENTION

180 Referring now to the drawings, Fig. 1 illustrates a corona discharge device or treater 10 embodying the invention and adapted to be used in conjunction with a printing press 12. In the preferred embodiment, the press 12 takes the form of a label or tag press, but it should be understood that the invention is equally adaptable to other systems involving flexo printing, coating or laminating of  
185 flexible webs or substrates.

Corona treater 10 is comprised of an integrated or on-board power supply cabinet 14 with a control panel 16 from which depends a rear end plate 18 and, in parallel relationship thereto, an adjustable front end plate 20 adapted to be connected to label press 12. As will be understood later, the adjustable front end plate 20 defines a salient feature of the invention which enables the universal  
190 mounting of the treater 10 to various press constructions. Supported below the cabinet 14 is a fixed electrode support tube 22 upon which a movable electrode magazine 24 having a series of parallel electrodes 25 is slidably disposed between an inoperative or maintenance position shown in Fig. 1, and an operative or web treating position shown in Figs. 2 and 3. A grounded treater roll 26 is mounted for a rotation on a shaft 27 between the end plates 18 and 20 beneath the support tube 22. A pair of web guide or idler rollers 28, 30 is mounted for rotation on respective  
195 shafts 32, 34 between the end plates 18 and 20, and lie in space relationship below the treater roll 26. As seen in Fig. 4, a flexible web 36 is guided upwardly by the idler rolls 28, 30 and wound about the treater roll 26 in spaced relationship from the magazine 24 and electrodes 25.  
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Referring now to Figs. 2 and 3, the power supply cabinet 14 includes a power supply 38 and a high voltage transformer 40 provided with a high voltage wire 42. The wire 42 terminates in a high voltage connection 44 normally enclosed  
205 by a high voltage cover plate 46 located behind rear end plate 18. A high voltage connection 44 forms another distinctive feature of the invention which will be more fully described hereafter. At this point, it should be appreciated that the high voltage connection 44 establishes a high voltage field between treater roll 26 and



one or more electrodes 25 with the substrate or web 36 to be treated interposed between electrodes 25 and roll 26. As is well known, the high voltage field establishes a corona discharge that causes the chemical composition of the material to be modified which, in turn, improves selected characteristics of the material such as wettability so that printed matter or coating may be more advantageously adhered thereto.

Support tube 22 passes through appropriate aligned cutouts in the respective end plates 18 and 20, and is supported by a bracket 47 attached to the cabinet 14. In the preferred embodiment, support tube 22 has a generally square cross section except for a rearward exhaust tube portion 48 which is generally circular in cross section. The exhaust tube 48 facilitates the venting of ozone generated during the corona treatment and cooling for the electrodes thereof.

As best seen in Figs. 1, 4 and 5, a slide track 50 having a groove 52 formed along its length is secured to each side of the support tube 22. Electrode magazine 24 has a pair of shields 53, 54 which are connected by fasteners 55 to the sides thereof. The magazine 24 also has a pair of slide rails 56 mounted to the inside, top portion of the shields 53, 54. The rails 56 align with the grooves 52 provided in the slide tracks 50 on support tube 22 and slidably support the electrode magazine 24 on the support tube 22 above the treater roll 26. A lever locking, rotatable handle 58 located on the front of the magazine 24 has a latch 60 engagable with a suitable opening in the bottom of the support tube 22 for holding the magazine 24 in the treating position shown in Figs. 2 and 3. When the need to attend to the web 36 arises, the handle 58 is opened and rotated allowing the magazine 24 to be slid forwardly (as shown in Fig. 1) opening up an area between the treater roll 26 and the support tube 22 for webbing the treater 10. A spring-set, detent pin 62 located on shield 53 of the magazine 24 engages with the support tube 22 and prevents magazine 24 from being completely removed. To remove the entire magazine 24 from the treater 10, the knob of the detent pin 62 must be pulled out allowing the magazine 24 to slide entirely away from the support tube 22. The slide track and slide rail structure provide a useful feature in slidably

supporting the magazine 24 relative to the support tube 22 to allow webbing of the  
treater 10 or complete removal of the magazine 24 for maintenance or cleaning of  
the electrodes 25.

Each slide track 50 is also provided at its forward and rearward ends  
with a diagonally extending slot 64 (Fig. 3) through which a shoulder screw 66 is  
passed for insertion in support tube 22. Mounted on the front of the support tube  
22 is an adjustment device 68 consisting of a rotatable knob 70 having a rod 72  
tightly screw threaded into a cover plate 74 on the support tube 22. Slide tracks 50  
are moved slightly back and forth and simultaneously up and down via the shoulder  
screw 66 riding in the slot 64 when the knob 70 is rotated. As a result, magazine 24  
which is attached to support tube 22 via the slide tracks 50 will be incrementally  
raised or lowered to enable fast, accurate adjustment of the gap 76 between the  
magazine 24 and the treater roll 26. This unique feature thus enables a convenient  
single point gap adjustment which provides the ability to locate a gap adjustment  
gauge (not shown) to set the desired gap adjustment.

Referring further to Figs. 3 and 4, the adjustable front end plate 20 is  
secured to the shafts 27, 32, and 34 by respective set screws 80, 82 and 84.  
Between the bottom of cabinet 14 and the top of support tube 22 is a rod and slide  
assembly or linear slide support 86 along which the top of the end plate 20 slides.  
Loosening of the screws 80, 82, 84 enables the end plate 20 to be slidably adjusted  
longitudinally along the shafts 27, 32 and 34 and slide support 86 such as to a  
position shown in phantom lines in Fig. 3, at which the screws 80, 82, 84 are again  
tightened. The treater roll 26 and the idler rolls 28, 30 may also be shifted into  
appropriate alignment along their respective shafts 27, 32, 34 once the end plate 20  
has been set. The adjustable end plate 20 provides a universal mounting device  
which enables the treater 10 to be easily adapted to various press machine frame  
variations.

Figs. 6 and 7 show the details of the high voltage connection 44  
between the electrodes 25 and the high voltage source 38, 40. Projecting  
rearwardly from the fixed rear end plate 18 is a pair of bolts 88 surrounded by non-

conductive spacers 90 and joined at their ends by a connector plate 92. The plate 92 has a center opening for receiving a spring loaded screw 94 having a rearward end connected to high voltage wire 42 and a forward end with an acorn nut 96. The acorn nut 96 is in electrical contact with a conductive bus bar 98 attached at the end of the electrodes 25 when the magazine 24 is in the operative or web treating position as shown in Fig. 6. The acorn nut 96 is disengaged from the conductive bar 98 when the magazine 24 is in the slide out position shown in Fig. 7. The high voltage connection 44 permits a fast, simple electrical connection between the electrodes 25 and the high voltage source 38, 40 which can be easily disconnected from the treater 10 making removal of the electrode magazine 24 safer and quicker.

It should be appreciated that the present invention provides a corona treater 10 which incorporates an on-board power supply saving the expense of installing a separate corona treating station and a separate power supply. The universal end plate 20 also enables a quick mounting arrangement to a wide variety of presses with a minimum of set up time. The slidable mounting of the electrode magazine 24 permits efficient webbing and maintenance. The front access, single point gap adjustment allows users to quickly and conveniently set the gap between the electrodes 25 and the treater roll 26. The high voltage connection 44 creates a hands-free, safer means by which the electrode magazine 24 may be removed without disabling a permanent connection of the high voltage wire 42.

While the invention has been described with reference to a preferred embodiment, those skilled in the art will appreciate that certain substitutions, alterations and omissions may be made without departing from the spirit thereof. Accordingly, the foregoing description is meant to be exemplary only and should not be deemed limitative on the scope of the invention.